



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/689,348	10/20/2003	Stephan Grunow	TI-36564	4206

23494 7590 08/23/2005

TEXAS INSTRUMENTS INCORPORATED
P O BOX 655474, M/S 3999
DALLAS, TX 75265

EXAMINER

FARAHANI, DANA

ART UNIT	PAPER NUMBER
----------	--------------

2891

DATE MAILED: 08/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

78

Office Action Summary	Application No. 10/689,348	Applicant(s) GRUNOW ET AL.	
	Examiner Dana Farahani	Art Unit 2891	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 3-7, 9-11, and 13-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art (AAPA), previously cited, in view of Chan et al., hereinafter Chan (US Patent 6,410,985), newly cited,

Regarding claim 1, AAPA discloses in figure 1, a low K dielectric with an upper surface formed over a semiconductor; a first trench, 45 at the left side, formed in the dielectric layer wherein the trench has sidewalls; a first contiguous barrier layer 30 formed to a thickness X1 over the upper surface of the dielectric layer and formed to a thickness X2 on the trench sidewalls.

AAPA does not disclose that X1 is greater than X2.

Chan discloses in figures 2A-2G, a trench, wherein a barrier layer 202 on the sidewalls have a thickness X2 and at the upper surface of the trench the layer has a thickness of X1, wherein X1 is greater than X2 (see column 5, lines 54-63). It would have been obvious to one of ordinary skill in the art at the time of the invention to make the X1 greater than X2 in the structure of AAPA, since thicker layers are undesirable as unnecessarily filling a portion of the limited width of the groove (see Chan, column 6, lines 1-3).

Regarding claim 3, AAPA discloses a second trench, at the right side of the first trench, is formed in the dielectric layer.

Regarding claims 4, 5, 7, and 11, AAPA in view of Chan renders obvious the claimed invention, as discussed above, except for expressly disclosing the ratio $X1$ to $X2$ is greater than 3 to 2. It would have been obvious to one of ordinary skill in the art at the time of the invention to determine the ratio of the distances $X1$ to $X2$ in accordance with the particular application in which the interconnect structure would be used. See *In re Boesch*, 617 F. 2d 272, 205 USPQ 215 (CCPA 1980) for the proposition that discovering an optimum value of a result effective variable involves routine skill in the art.

Regarding claims 6, 9, 13, and 16, Chan discloses a second barrier layer 204 over the first contiguous barrier layer.

Regarding claims 10, 14, and 15, AAPA in view of Chan renders obvious the claimed invention, as discussed above, except for expressly disclosing the dielectric layer having a dielectric constant less than or equal 3.7. It would have been obvious to one of ordinary skill in the art at the time of the invention to determine the kind of material that would be suitable as the dielectric layer in accordance with the availability and cost of the material, and one of ordinary skill in the art preference of how much the parasitic capacitance should be reduced for a particular application. See *In re Leshin*, 125 USPQ 416, for the proposition that it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use.

Regarding claims 2, 8, and 12, AAPA in view of Chan renders obvious the claimed invention, except for the plurality of trenches are separated from each other by a distance of less

Art Unit: 2891

than 160 nm. It would have been obvious to one of ordinary skill in the art at the time of the invention to adjust the distance between the trenches less than a particular value in accordance to the size of the device which implements the interconnect structure. See *In re Boesch*, 617 F. 2d 272, 205 USPQ 215 (CCPA 1980) for the proposition that discovering an optimum value of a result effective variable involves routine skill in the.

Response to Arguments

3. Applicant's arguments with respect to the previously rejected claims have been considered but are moot in view of the new grounds of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dana Farahani whose telephone number is (571)272-1706. The examiner can normally be reached on M-F 9:00AM - 6:00PM.

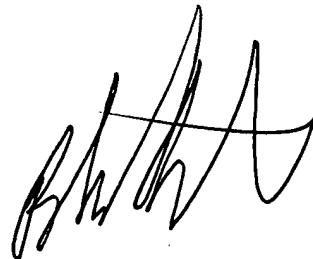
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Baumeister can be reached on (571)272-1722. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

**B. WILLIAM BAUMEISTER
SUPERVISORY PATENT EXAMINER**

Art Unit: 2891

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

D. Farahani

A handwritten signature in black ink, appearing to read 'B. William Baumeister', with a stylized, cursive script.

**B. WILLIAM BAUMEISTER
SUPERVISORY PATENT EXAMINER**